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(54) Title: **ORYNEBACTERIUM GLUTAMICUM GENES ENCODING PHOSPHOENOLPYRUVATE: SUGAR PHOSPHOTRANSFERASE SYSTEM PROTEINS**

(57) Abstract: Isolated nucleic acid molecules, designated PTS nucleic acid molecules, which encode novel PTS proteins from *Corynebacterium glutamicum* are described. The invention also provides antisense nucleic acid molecules, recombinant expression vectors containing PTS nucleic acid molecules, and host cells into which the expression vectors have been introduced. The invention still further provides isolated PTS proteins, mutated PTS proteins, fusion proteins, antigenic peptides and methods for the improvement of production of a desired compound from *C. glutamicum* based on genetic engineering of PTS genes in this organism.

INTERNATIONAL SEARCH REPORT

International Application No

PC1/IB 00/00973

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 C12N15/54 C12N15/31 C12N9/00 C12N9/12 C12N15/77
C12P1/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C12N C12P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, BIOSIS, STRAND

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 98 18931 A (DOUGHERTY BRIAN A ; HUMAN GENOME SCIENCES INC (US); ROSEN CRAIG A () 7 May 1998 (1998-05-07)</p> <p>abstract; claims 8-20 see SEQ ID NO: 30, nucleotides 8500-9200 (p. 323) page 5 -page 7</p> <p style="text-align: center;">---</p> <p style="text-align: center;">-/--</p>	<p>1-3, 5-13, 15-19, 21, 25-27, 30-35,37</p>

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

14 November 2000

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19.02.01

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/IB 00/00973

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WAGNER E. ET AL: "Cloning and characterization of the scrA gene encoding the sucrose-specific enzyme II of the phosphotransferase system from <i>Staphylococcus xylosus</i> ." MOLECULAR & GENERAL GENETICS, vol. 241, no. 1-2, 1993, pages 33-41, XP002152722 ISSN: 0026-8925 the whole document ---	1-3, 5-13, 15-19, 21, 25-27, 30-37
A	LEE J-K ET AL: "Nucleotide sequence of the gene encoding the <i>Corynebacterium glutamicum</i> mannose enzyme II and analyses of the deduced protein sequence." FEMS MICROBIOLOGY LETTERS, vol. 119, no. 1-2, 1994, pages 137-145, XP000960685 ISSN: 0378-1097 the whole document ---	
A	DOMINGUEZ H ET AL: "Complete sucrose metabolism requires fructose phosphotransferase activity in <i>Corynebacterium glutamicum</i> to ensure phosphorylation of liberated fructose." APPLIED AND ENVIRONMENTAL MICROBIOLOGY, vol. 62, no. 10, 1996, pages 3878-3880, XP000960659 ISSN: 0099-2240 the whole document ---	
A	EP 0 358 940 A (DEGUSSA) 21 March 1990 (1990-03-21) the whole document -----	

INTERNATIONAL SEARCH REPORT

In ternational application No.
PCT/IB 00/00973

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☒ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

Although claim 35 is directed to a diagnostic method practised on the human/animal body, the search has been carried out and based on the alleged effects of the compound/composition.
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a):

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Claims 1-38 , partially.

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: {1-38 partially}

An isolated nucleic acid from *Corynebacterium glutamicum* encoding a phosphoenolpyruvate:sugar phosphotransferase system protein as set forth in SEQ ID NO: 1. A vector, a host, a polypeptide as set forth in SEQ ID NO: 2, a method for producing fine chemicals, a method for diagnosing using said nucleic acid.

2. Claims: {1-38 partially}

same as invention 1 but comprising SEQ ID NO: 5 and 6.

3. Claims: {1-38 partially}

same as invention 1 but comprising SEQ ID NO: 7 and 8.

4. Claims: {1-38 partially}

same as invention 1 but comprising SEQ ID NO: 15 and 16.

5. Claims: {1-38 partially}

same as invention 1 but comprising SEQ ID NO: 17 and 18.

6. Claims: {1-38 partially}

same as invention 1 but comprising SEQ ID NO: 21 and 22.

7. Claims: {1-38 partially}

same as invention 1 but comprising SEQ ID NO: 23 and 24.

8. Claims: {1-38 partially}

same as invention 1 but comprising SEQ ID NO: 25 and 26.

9. Claims: {1-38 partially}

same as invention 1 but comprising SEQ ID NO: 27 and 28.

10. Claims: {1-38 partially}

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

same as invention 1 but comprising SEQ ID NO: 29 and 30.

11. Claims: {18, 19, 22, 36-38 partially}

An isolated phosphoenolpyruvate:sugar phosphotransferase system protein from *Corynebacterium glutamicum* as set forth in SEQ ID NO: 4, a host cell comprising a nucleic acid molecule as set forth in SEQ ID NO: 3.

12. Claims: {18, 19, 22, 36-38 partially}

same as invention 11 but comprising SEQ ID NO: 9 and 10.

13. Claims: {18, 19, 22, 36-38 partially}

same as invention 11 but comprising SEQ ID NO: 11 and 12.

14. Claims: {18, 19, 22, 36-38 partially}

same as invention 11 but comprising SEQ ID NO: 13 and 14.

15. Claims: {18, 19, 22, 36-38 partially}

same as invention 11 but comprising SEQ ID NO: 19 and 20.

16. Claims: {18, 19, 22, 36-38 partially}

same as invention 11 but comprising SEQ ID NO: 31 and 32.

17. Claims: {18, 19, 22, 36-38 partially}

same as invention 11 but comprising SEQ ID NO: 33 and 34.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/IB 00/00973

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